

WE CLAIM:

1. A heating apparatus comprising:

a blower box;

at least one heating section wall defining a heating space in fluid communication with said blower box, said heating space having a back side proximate said blower box and an opposite facing front side disposed distal from said blower box;

a plurality of spaced apart pairs of spaced apart first and second heated air distribution plenums disposed in said heating space, said spaced apart first and second heated air distribution plenums having a heated air inlet opening in fluid communication with said blower box and said spaced apart pairs forming a return air conduit therebetween extending between said back side and said front side of said heating space and having a return air outlet end in fluid communication with said blower box;

each of said first and second heated air distribution plenums having a substantially planar heated air distribution plate facing a space between said first and second heated air distribution plenums and having a plurality of heated air outlet openings; and

a heating surface suitable for supporting an object to be heated disposed between said spaced apart first and second heated air distribution plenums.

2. A heating apparatus in accordance with Claim 1, wherein said heating surface is a conveyor surface.

3. A heating apparatus in accordance with Claim 1 further comprising a plurality of blowers disposed within said blower box, 50% of said blowers having a blower output in fluid communication with one of said spaced apart pairs of said first and second spaced apart heated air distribution plenums and a remaining 50% of said blowers having a blower output in fluid communication with another of said spaced apart pairs of spaced apart first and second heated air distribution plenums.

4. A heating apparatus in accordance with Claim 3, wherein two said blowers are disposed within said blower box.

5. A heating apparatus in accordance with Claim 4, wherein each of said blowers comprises a blower motor disposed outside of said blower box, each of said blowers comprising a blower shaft oriented parallel to a direction of flow of supply air into said spaced apart heated air distribution plenums.

6. A heating apparatus in accordance with Claim 4, wherein said blowers are positioned within said blower box diagonally with respect to each other.

7. A heating apparatus in accordance with Claim 4, wherein two 90° elbow transition sections are disposed within said blower box, providing said fluid communication between each said blower outlet and a corresponding pair of said first and second heated air distribution plenums.

8. A heating apparatus in accordance with Claim 1, wherein each of said heated air distribution plenums has a vertically tapered shape with a widest portion of said tapered shape oriented toward said blower box.

9. A heating apparatus in accordance with Claim 1, wherein at least a portion of said heated air outlet openings comprise a nozzle wall extending into said heated air distribution plenum, said nozzle wall having a shape whereby heated air flowing through said openings has a direction of flow substantially perpendicular to said heating surface.

10. A heating apparatus in accordance with Claim 1, wherein at least a portion of said heated air outlet openings comprise a nozzle wall extending in a direction of said heating surface, said nozzle wall having a shape whereby heated air flowing through said openings has a direction of flow substantially perpendicular to said heating surface.

11. A heating apparatus in accordance with Claim 9, wherein said nozzle wall is longer on a side of said heated air outlet opening distal from said blower box.

12. A heating apparatus in accordance with Claim 10, wherein said nozzle wall is longer on a side of said heated air outlet opening distal from said blower box.

13. A heating apparatus in accordance with Claim 7, wherein at least one turning vane is disposed in each of said 90° elbow transition sections.

14. A heating apparatus in accordance with Claim 1 further comprising at least one burner tube disposed within said air supply plenum proximate said return air outlet end of said return air conduit.

15. A heating apparatus in accordance with Claim 1 further comprising a return air duct disposed in each corner of said heated space extending from said first side to said second side and having a return air duct inlet opening in fluid communication with said heating space and a return air duct outlet opening in fluid communication with said air supply plenum.

16. A heating apparatus in accordance with Claim 7 further comprising a diffuser section having a wide portion and a narrow portion disposed between said 90° elbow transition section and said heated air distribution plenums, said wide portion oriented toward said heated air distribution plenums and said narrow portion oriented toward said 90° elbow transition section.

17. A heating apparatus in accordance with Claim 16, wherein at least one guide vane is disposed within said diffuser section.

18. A heating apparatus in accordance with Claim 1 further comprising opposed return air conduit sidewalls extending between said spaced apart pairs of said spaced apart first and second heated air distribution plenums from said back side to said front side of said heating space, said ends of said sidewalls proximate said front side having a convex profile oriented toward an interior of said return air conduit.

19. A heating apparatus comprising:

at least one wall enclosing a blower box and forming at least one air inlet opening and at least two air outlet openings;

at least one heating section wall defining a heating space adjacent to and in fluid communication with said blower box;

two spaced apart pairs of spaced apart heated air distribution plenums, said spaced apart pairs forming a return air conduit therebetween, said return air conduit having a return air outlet end in fluid communication with said at least one air inlet opening and said spaced apart heated air distribution plenums having a heated air inlet opening in fluid communication with said at least two air outlet openings;

a horizontal heating surface disposed between each pair of said spaced apart heated air distribution plenums; and

each of said heated air distribution plenums comprising a substantially horizontally disposed perforated heated air distribution plate facing said horizontal heating surface.

20. A heating apparatus in accordance with Claim 19 further comprising at least one burner tube disposed within said blower box proximate said at least one air inlet opening.

21. A heating apparatus in accordance with Claim 19, wherein said horizontal heating surface is a conveyor surface.

22. A heating apparatus in accordance with Claim 19, wherein each of said heated air distribution plenums is vertically tapered whereby said narrow side is disposed distal from said blower box.

23. A heating apparatus in accordance with Claim 19, wherein said perforated heated air distribution plates comprise a nozzle wall disposed around each perforation extending one of toward said heating surface and into an interior of said heated air distribution plenum.

24. A heating apparatus in accordance with Claim 23, wherein said nozzle walls are asymmetrical in length with a longest length disposed on a side of said perforations distal from said blower box.

25. A heating apparatus in accordance with Claim 19 further comprising two blowers disposed within said blower box, each of said blowers having a blower air inlet in fluid communication with said at least one air inlet opening and having a blower air outlet in fluid communication with each heated air distribution plenum of one of said pairs of spaced apart heated air distribution plenums.

26. A heating apparatus in accordance with Claim 25, wherein each of said blowers comprises a blower motor disposed external to said blower box, said blower motor having a drive shaft extending parallel to a direction of flow of air into said heated air distribution plenums.

27. A heating apparatus in accordance with Claim 25, wherein said blowers are positioned within said blower box diagonally with respect to each other.

28. A heating apparatus in accordance with Claim 25, wherein a 90° elbow transition conduit is connected to each blower air outlet, thereby providing a fluid communication conduit between said blower air outlet and said heated air distribution plenums.

29. A heating apparatus in accordance with Claim 28, wherein at least one turning vane is disposed within said 90° elbow transition conduit.

30. A heating apparatus in accordance with Claim 28, further comprising a diffuser section having a wide portion and a narrow portion disposed between said 90° elbow transition conduit and said heated air distribution plenums, said wide portion oriented toward said heated air distribution plenums and said narrow portion oriented toward said 90° elbow transition conduit.



31. A heating apparatus in accordance with Claim 30, wherein at least one guide vane is disposed within said diffuser section.

32. A heating apparatus in accordance with Claim 19 further comprising opposed return air conduit sidewalls extending between said two spaced apart pairs of spaced apart heated air distribution plenums from a back side to a front side of said heating space, said ends of said sidewalls proximate said front side having a convex profile oriented toward an interior of said return air conduit.